

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in this application.

Listing of claims:

1. (Currently amended) A method of processing a semiconductor substrate, comprising the steps of:

depositing a protective layer on a topographically substantially flat substrate surface comprising a an exposed conductive element;

selectively removing a portion of the protective layer to expose the conductive element of the substrate surface;

electrolessly depositing a metallic passivating layer onto the exposed conductive element, wherein stray metallic passivating material is also deposited on the protective layer; and

removing at least a portion of the protective layer from the substrate after deposition of the metallic passivating layer, wherein the stray metallic passivating material deposited on the protective layer is also removed.
2. (Original) The method of claim 1, wherein the substrate surface comprises a dielectric material in which the conductive element is disposed.
3. (Original) The method of claim 1, wherein the substrate surface comprises a low k dielectric material.
4. (Original) The method of claim 1, wherein a portion of the thickness of the protective layer is removed.
5. (Original) The method of claim 1, wherein the entire thickness of the protective layer is removed.

6. (canceled)
7. (Original) The method of claim 1, wherein the step of depositing a protective layer is accomplished using a technique selected from the group consisting of chemical vapor deposition (CVD), plasma enhance chemical vapor deposition (PECVD), spin on deposition and physical vapor deposition.
8. (Original) The method of claim 1, wherein the protective layer comprises an organic material.
9. (Original) The method of claim 8, wherein the organic material of the layer is selected from the group consisting of photoresist and amorphous carbon.
10. (Original) The method of claim 9, wherein the steps of depositing and processing the photoresist protective layer comprise the steps of:
depositing a photoresist over the substrate surface; and
exposing and developing the photoresist under conditions that do not degrade the substrate surface to expose a selected region of an underlying layer.
11. (Original) The method of claim 10, wherein the exposed and developed photoresist is removed after deposition of the metallic passivating layer by ashing or wet chemical etch.
12. (Original) The method of claim 9, wherein the steps of depositing and processing the amorphous carbon protective layer comprise the steps of:
depositing an amorphous carbon layer over the substrate surface; and
etching the amorphous carbon layer under conditions that do not degrade the substrate surface.

13. (Original) The method of claim 12, wherein the amorphous carbon layer is removed after deposition of the metallic passivating layer by ashing or reactive ion etch.
14. (Original) The method of claim 1, wherein the protective layer comprises a dielectric material.
15. (Original) The method of claim 14, wherein steps of depositing and processing the dielectric protective layer comprise the steps of:
depositing a dielectric layer over the substrate surface; and
selectively etching the dielectric layer under conditions that do not degrade the substrate surface.
16. (Original) The method of claim 15, wherein the dielectric protective layer is removed after deposition of the passivating layer by etching using a technique selected from the group consisting of wet etch, dry etch, reactive ion etch and plasma etch.
17. (Original) The method of claim 1, where steps for depositing and processing the protective layer comprise the steps of:
depositing an intermediate layer on the substrate surface;
depositing a protective layer on the intermediate layer;
selectively removing the protective layer to expose the intermediate layer; and
selectively removing the intermediate layer under conditions that do not degrade the conductive element.
18. (Original) The method of claim 17, wherein the intermediate layer comprises an etch stop and the protective layer comprises a photoresist.
19. (Original) The method of claim 17, wherein the intermediate layer comprises a dielectric material.

20. (Original) The method of claim 1, wherein the conductive material comprises copper.
21. (Original) The method of claim 1, wherein the passivating layer is selected from the group consisting of ruthenium, tantalum, tungsten, cobalt, palladium, nickel, tin, titanium, molybdenum, platinum, iron, and niobium, and alloys thereof.
22. (Canceled).
23. (Currently amended) The method of claim ~~22~~ 1, wherein the step of electrolessly depositing a metallic passivating layer comprises the steps of:
depositing an initiation layer on the first conductive material by exposing the substrate to an activation solution;
cleaning the substrate after deposition of the initiation layer; and
depositing a metallic passivating layer on the initiation layer by exposing the initiation layer to an electroless solution.
24. (Currently amended) A method of processing a semiconductor substrate, comprising:
steps for depositing a protective layer on a topographically substantially flat ~~the~~ substrate surface comprising a conductive element disposed in a dielectric material;
steps for processing the protective layer to expose the conductive element;
steps for electrolessly depositing a metallic passivating layer onto the conductive element and depositing stray metallic passivating material on the protective layer; and
steps for removing at least a portion of the protective layer from the substrate after electroless deposition, wherein the stray metallic passivating material deposited on the protective layer is also removed.
25. (Original) The method of claim 24, wherein the step of depositing a metallic passivating layer comprises the steps of:

steps for depositing an initiation layer on the first conductive material by exposing the substrate to an activation solution;

steps for cleaning the substrate after deposition of the initiation layer; and

steps for depositing a metallic passivating layer on the initiation layer by exposing the initiation layer to an electroless solution.

26. (Original) The method of claim 24, where steps for depositing and processing the protective layer comprise the steps of:

steps for depositing an intermediate layer on the substrate surface;

steps for depositing a protective layer on the intermediate layer;

steps for exposing and developing the protective layer to expose the intermediate layer;

and

steps for etching the intermediate layer under conditions that do not degrade the conductive element.

27. (Original) The method of claim 24, wherein steps for depositing and processing an amorphous carbon protective layer comprise the steps of:

steps for depositing an amorphous carbon layer over the substrate surface; and

steps for etching the amorphous carbon layer under conditions that do not degrade the conductive element.

28. (Original) The method of claim 24, wherein the steps for depositing and processing a photoresist protective layer comprise the steps of:

steps for depositing a photoresist over the substrate surface; and

steps for exposing and developing the photoresist under conditions that do not degrade the conductive element.

29. (Original) The method of claim 24, wherein the steps of depositing and processing a dielectric protective layer comprise the steps of:

steps for depositing a dielectric protective layer over the substrate surface; and

steps for etching the dielectric protective layer under conditions that do not degrade the conductive element.

30. (Currently amended) A system for processing a semiconductor substrate, comprising:

means for depositing a protective layer on ~~the~~ a topographically substantially flat substrate surface comprising a conductive element disposed in a dielectric material;

means for processing the protective layer to expose the conductive element;

means for electrolessly depositing a metallic passivating layer onto the conductive element, and for depositing stray metallic passivating material on the protective layer; and

means for removing at least a portion of the protective layer from the substrate after electroless deposition, and for removing the stray metallic passivating material deposited on the protective layer.

31. (Original) The system of claim 30, wherein the steps for depositing and processing a photoresist protective layer comprises the steps of:

means for depositing a photoresist over the substrate surface; and

means for exposing and developing the photoresist under conditions that do not degrade the conductive element.

32. (Original) The system of claim 30, wherein the step of electrolessly depositing a metallic passivating layer comprises the steps of:

means for depositing an initiation layer on the first conductive material by exposing the substrate to an activation solution;

means for cleaning the substrate after deposition of the initiation layer; and
steps for depositing a metallic passivating layer on the initiation layer by exposing the initiation layer to an electroless solution.

33. (Original) The system of claim 30, where steps for depositing and processing the protective layer comprises the steps of:
means for depositing an intermediate layer on the substrate surface;
means for depositing a protective layer on the intermediate layer;
means for exposing and developing the protective layer to expose the intermediate layer;
and
means for etching the intermediate layer under conditions that do not degrade the conductive element.

34. (Original) The system of claim 30, wherein steps for depositing and processing an amorphous carbon protective layer comprises the steps of:
means for depositing an amorphous carbon layer over the substrate surface; and
means for etching the amorphous carbon layer under conditions that do not degrade the conductive element.

35. (Original) The system of claim 30, wherein depositing and processing a dielectric protective layer comprises:
means for depositing a dielectric layer over the substrate surface; and
means for etching the dielectric layer under conditions that do not degrade the conductive element.

36 – 42. (canceled)